

Unit 15 Day 8

p 339-340: 16-33, 36-39, 52, 53, all Review

$$\textcircled{16} \frac{x^3 + x^2 - 11x - 10}{x-3}$$

$$\begin{array}{r|rrrr} 2 & 1 & 1 & -11 & -10 \\ & & 3 & 12 & 3 \\ \hline & 1 & 4 & 1 & -7 \end{array}$$

$$x^2 + 4x + 1 - \frac{7}{x-3}$$

$$\textcircled{17} \frac{3x^3 + 8x^2 + 5x + 10}{x+2}$$

$$\begin{array}{r|rrrr} -2 & 3 & 8 & 5 & 10 \\ & & -6 & -4 & -2 \\ \hline & 3 & 2 & 1 & 8 \end{array}$$

$$3x^2 + 2x + 1 + \frac{8}{x+2}$$

$$\textcircled{18} f(x) = -x^3 + 5x^2 - 7x + 1$$

$$\begin{array}{r|rrrr} 2 & -1 & 5 & -7 & 1 \\ & & -2 & 6 & -2 \\ \hline & -1 & 3 & -1 & -1 \end{array}$$

$$f(2) = -1$$

$$\textcircled{19} f(x) = 2x^3 - 3x^2 + 7x - 12$$

$$\begin{array}{r|rrrr} 2 & 2 & -3 & 7 & -12 \\ & & 4 & 2 & 18 \\ \hline & 2 & 1 & 9 & 6 \end{array}$$

$$f(2) = 6$$

$$\textcircled{20} f(x) = 5x^4 - 12x^2 + 2x - 8$$

$$\begin{array}{r|rrrrr} 2 & 5 & 0 & -12 & 2 & -8 \\ & & 10 & 20 & 16 & 36 \\ \hline & 5 & 10 & 8 & 18 & 28 \end{array}$$

$$f(2) = 28$$

$$\textcircled{21} f(x) = x^5 + 4x^2 - 2x - 4$$

$$\begin{array}{r|rrrrrr} 2 & 1 & 0 & 0 & 4 & -2 & -4 \\ & & 2 & 4 & 8 & 24 & 44 \\ \hline & 1 & 2 & 4 & 12 & 22 & 40 \end{array}$$

$$f(2) = 40$$

$$\textcircled{22} 7, 20$$

$$\textcircled{23} A, C$$

$$\textcircled{24} f(x) = (x+1)(x-4)(x-7)$$

$$f(x) = (x^2 - 3x - 4)(x-7)$$

$$f(x) = x^3 - 3x^2 - 4x - 7x^2 + 21x + 28$$

$$f(x) = x^3 - 10x^2 + 17x + 28$$

$$\textcircled{25} 8, 2, 3$$

$$f(x) = (x-8)(x-2)(x-3)$$

$$f(x) = (x^2 - 10x + 16)(x-3)$$

$$f(x) = x^3 - 10x^2 + 16x - 3x^2 + 30x - 48$$

$$f(x) = x^3 - 13x^2 + 46x - 48$$

$$\textcircled{27} -2 + \sqrt{5}, -2 - \sqrt{5}, -2, 1$$

$$(x + 2 - \sqrt{5})(x + 2 + \sqrt{5})(x+2)(x-1)$$

$$(x^2 + 2x + x\sqrt{5} + 2x + 4 + 2\sqrt{5})$$

$$= (x^2 + 4x + 1)(x^2 + 7x - 2)$$

$$(x^2 + 4x + 1)(x^2 + 7x - 2)$$

$$x^4 + x^3 - 2x^2 + 4x^3 + 4x^2 - 8x - x^2 - x + 2$$

$$x^4 + 5x^3 + x^2 - 9x + 2$$

$$\textcircled{26} \sqrt{3}, -\sqrt{3}, 2, 3$$

$$f(x) = (x - \sqrt{3})(x + \sqrt{3})(x-2)(x-3)$$

$$f(x) = (x^2 - 3)(x^2 - 5x + 6)$$

$$f(x) = x^4 - 5x^3 + 6x^2 - 3x^2 + 15x - 18$$

$$f(x) = x^4 - 5x^3 + 3x^2 + 15x - 18$$

$$(28) f(x) = 2x^3 - 9x^2 - 6x + 5$$

$$p \pm 1, \pm 2, \pm 5$$

$$q \pm 1, \pm 2$$

$$\frac{p}{q} \pm 1, \pm 2, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}$$

	2	-9	-6	5
0				5
1	2	-7	-13	-8
$\frac{1}{2}$	2	-8	-10	0

$$f(x) = (x - \frac{1}{2})(2x^2 - 8x - 10)$$

$$f(x) = (2x - 1)(x^2 - 4x - 5)$$

$$f(x) = (2x - 1)(x - 5)(x + 1)$$

$$x = \frac{1}{2}, 5, -1$$

$$(29) f(x) = 8x^4 - 14x^3 - 29x^2 - 4x + 3$$

$$p \pm 1, \pm 3$$

$$q \pm 1, \pm 2, \pm 4, \pm 8$$

$$\frac{p}{q} \pm 1, \pm 3, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{1}{4}, \pm \frac{3}{4}, \pm \frac{1}{8}, \pm \frac{3}{8}$$

	8	-14	-29	-4	3
0					3
1	8	-6	-35	-39	-36
$\frac{1}{2}$	8	-10	-34	-21	$-\frac{15}{2}$
$\frac{1}{4}$	8	-12	-32	-12	0

$$f(x) = (x - \frac{1}{4})(8x^3 - 12x^2 - 32x + 12)$$

$$f(x) = (4x - 1)(2x^3 - 3x^2 - 8x + 3)$$

	2	-3	-8	-3
-1	2	-5	-3	0

$$f(x) = (4x - 1)(x + 1)(2x^2 - 5x - 3)$$

$$f(x) = (4x - 1)(x + 1)(2x + 1)(x - 3)$$

$$x = \{\frac{1}{4}, -1, -\frac{1}{2}, 3\}$$

(30)

-1	2	1	-4	3	1
		-2	1	3	-6
	2	-1	-3	6	-5

No

(31)

-1	1	2	3	2
		-1	-1	-2
	1	1	2	0

Yes

$$(32) a(x+2)(x-1)(x-4) \quad f(2)=16$$

$$a(x^2 + x - 2)(x - 4)$$

$$a(x^3 + x^2 - 2x - 4x^2 - 4x + 8)$$

$$a(x^3 - 3x^2 - 6x + 8)$$

$$f(2)=16$$

$$16 = a[2^3 - 3(2)^2 - 6(2) + 8]$$

$$16 = a(8 - 12 - 12 + 8)$$

$$16 = -8a$$

$$-2 = a$$

$$f(x) = -2x^3 + 6x^2 + 12x + 16$$

$$(33) 3, 1, -1-3i, -1+3i; f(2)=-36$$

$$a(x-3)(x-1)(x+1+3i)(x+1-3i)$$

$$a(x^2 - 4x + 3)(x^2 + x - 3ix + x + 1 - 3ix - 3ix + 3i + 9)$$

$$a(x^2 - 4x + 3)(x^2 + 2x + 10)$$

$$a(x^4 + 2x^3 + 10x^2 - 4x^3 - 8x^2 - 40x + 3x^2 + 60x + 30)$$

$$a(x^4 - 2x^3 + 5x^2 - 34x + 30)$$

$$f(2) = -36$$

$$-36 = a(2^4 - 2(2)^3 + 5(2)^2 - 34(2) + 30)$$

$$-36 = a(16 - 16 + 20 - 68 + 30)$$

$$-36 = a(-18)$$

$$a = 2$$

$$f(x) = 2x^4 - 4x^3 + 10x^2 - 68x + 60$$

Unit 15 Day 8 continued

Review

(36) $f(x) = x^4 - 3x^3 - 8x^2 + 22x - 24$

$1-i$ and $1+i$ are both solutions

$$(x - 1 + i)(x - 1 - i)$$

$$x^2 - x - \cancel{ix} - x + 1 + \cancel{i} \cancel{ix} \cancel{x} + 1$$

$$x^2 - 2x + 2$$

$$x^2 - 2x + 2 \overline{) x^4 - 3x^3 - 8x^2 + 22x - 24}$$

$$-x^4 + 2x^3 + 2x^2$$

$$-x^3 - 10x^2 + 22x - 24$$

$$+x^3 + 2x^2 + 2x$$

$$-12x^2 + 24x - 24$$

$$-12x^2 + 24x - 24$$

0

$$f(x) = (x - 1 + i)(x - 1 - i)(x^2 - x - 12)$$

$$f(x) = (x - 1 + i)(x - 1 - i)(x - 4)(x + 3)$$

$$x = \{1 - i, 1 + i, 4, -3\}$$

(37) $f(x) = 2x^4 - x^3 + 7x^2 - 4x - 4$

$1, 2i, -2i$ are zeroes

$$1 \overline{) 2 \quad -1 \quad 7 \quad -4 \quad -4}$$

$$2 \quad 1 \quad 8 \quad 4$$

$$2 \quad 1 \quad 8 \quad 4 \quad 0$$

$$f(x) = (x - 1)(2x^3 + x^2 + 8x + 4)$$

$$2i \overline{) 2 \quad 1 \quad 8 \quad 4}$$

$$4i \quad 2i - 8 \quad -4$$

$$2 \quad 1 + 4i \quad 2i \quad 0$$

$$f(x) = (x - 1)(x - 2i)(2x^2 + (1 + 4i)x + 2i)$$

$$-2i \overline{) 2 \quad 1 + 4i \quad 2i}$$

$$-4i \quad -2i$$

$$2 \quad 1 \quad 0$$

$$f(x) = (x - 1)(x - 2i)(x + 2i)(2x + 1)$$

$$x = \{1, 2i, -2i, -\frac{1}{2}\}$$

(38) $x - 4$ is factor of

$$f(x) = x^3 - 2x^2 + 5x + 4$$

$$f(4) = 0$$

$$0 = (4)^3 - 2(4)^2 + 5(4) + 4$$

$$0 = 64 - 32 + 4x + 4$$

$$0 = 36 + 4x$$

$$-36 = 4x$$

$$\boxed{-9 = x}$$

(39) $f(x) = x^3 - 3x^2 + 8x - 4$

$$f(2) = 5$$

$$5 = 2^3 - 3(2)^2 + 8(2) - 4$$

$$5 = 8 - 12 + 16 - 4$$

$$5 = -8 + 16$$

$$13 = 2S$$

$$\boxed{\frac{13}{2} = S}$$

(52) $f(x) = 3x^3 - 8x^2 + x + 2$

	3	-8	1	2
0				2
-1	3	-11	12	-10

> 0 b/w 0 & -1

	3	-8	1	2
2	3	-2	-4	-6
3	3	1	4	14

> 0 b/w 2 & 3

(53) $f(x) = 6x^4 + 13x^3 - 11x^2 - 3x + 5$

No real zero greater than 1
or less than -3

	6	13	-11	-3	5
1	6	19	8	5	10
-3	6	-5	4	-15	50

all \oplus \therefore No zero > 1

alternating signs \therefore No
real zero < -3